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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/005,094 | 12/07/2001 | Suk Won Choi | 8733.500.00 | 8570 |

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EXAMINER

SMOOT, STEPHEN W

| ART UNIT | PAPER NUMBER |
|----------|--------------|
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2813

4

DATE MAILED: 04/09/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/005,094

Applicant(s)

CHOI ET AL.

Examiner

Stephen W. Smoot

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 December 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 December 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

This Office action is in response to application papers filed on 07 December 2001.

Drawings

1. The drawings are objected to because in Fig. 8, the legend does not agree with the written description (compare to page 5, lines 23-26), which indicates that the circles should correspond to "after heat stress" and the triangles should correspond to "before heat stress". A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: Liquid Crystal Display with Ferroelectric Liquid Crystal Formed in a Polymer Network and Fabricating Method Thereof.

Claim Objections

3. Claim 21 is objected to because of the following informality:

In claim 21, line 3, change "the two states" to --two states--.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claim 3 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 3 recites the limitation "when the ferroelectric liquid crystal is uniformly aligned" in lines 2-3. There is insufficient antecedent basis for this limitation in claim 3.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1-10, 19-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakaigawa et al. in view of Yamazaki et al.

Referring to Fig. 1 and column 13, line 46 to column 14, line 67, Sakaigawa et al. disclose a ferroelectric liquid crystal cell with the following structural features:

- Two opposing glass substrates (1, 2) are provided;
- ITO electrodes (L, S) are formed on the glass substrates (1, 2), it is noted that indium tin oxide (aka ITO) has the inherent property of being transparent in the visible portion of the light spectrum;
- Alignment films (5, 6) are formed over the electrodes (L, S);
- The alignment films (5, 6) are rubbed;
- Ferroelectric liquid crystal (12) that includes a uv-sensitive photopolymer is filled between the alignment films (5, 6); and
- The ferroelectric liquid crystal (12) has isotropic, nematic, and smectic phases (see column 12, lines 29-47).

These are limitations set forth in claims 1, 19 of the applicant's invention.

However, Sakaigawa et al. do not expressly teach or suggest a pixel electrode (a limitation of claim 1) nor a TFT array layer (a limitation of claim 19).

Referring to Figs. 2(B), Yamazaki et al. disclose a liquid crystal cell that has a TFT active matrix (117) formed on one of the opposing glass substrates (116) that includes an ITO pixel electrode (113) (see column 7, lines 41-50).

Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teachings of Sakaigawa et al. and Yamazaki et al. in order to form TFTs as taught by Yamazaki et al. on one of the substrates of Sakaigawa et al. using the ITO electrodes as pixel electrodes. Yamazaki et al. recognize that TFTs can be used to control the cell images of liquid crystal displays and in such applications the transparent ITO pixel electrodes can be used to address these individual TFTs (see column 8, lines 1-8).

Regarding claims 2-10, 20-28, these are product-by-process claims and the patentability of a product does not depend on its method of production (see MPEP section 2113). The burden now shifts to the applicant to show that claims 2-10, 20-28 have an unobvious structural difference to claims 1, 19 as rejected above.

8. Claims 11, 14-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakaigawa et al. in view of Yamazaki et al. and as evidenced by Wolf and Tauber.

Referring to Fig. 1 and column 13, line 46 to column 14, line 67, Sakaigawa et al. disclose a method of manufacturing a ferroelectric liquid crystal cell with the following features:

- Two opposing glass substrates (1, 2) are provided;

- ITO electrodes (L, S) are formed on the glass substrates (1, 2), it is noted that indium tin oxide (aka ITO) has the inherent property of being transparent in the visible portion of the light spectrum;
- Alignment films (5, 6) are formed over the electrodes (L, S);
- The alignment films (5, 6) are rubbed;
- The two substrates (1, 2) are bonded together by a seal member (11);
- Mixture A (12) of a ferroelectric liquid crystal and a liquid monomer is injected between the alignment films (5, 6);
- The liquid crystal cell is heated to 90 degrees C, a temperature at which the ferroelectric liquid crystal exhibits a nematic phase, and the monomer is then polymerized by irradiation with ultraviolet light (also see column 12, lines 19-28);
- The ultraviolet light for the photopolymerization step has a 360 nm wavelength with an intensity of 4 mW/cm^2 for 5 minutes (or 1200 mJ/cm^2) (see column 14, lines 24-27); and
- After the photopolymerization step, the liquid crystal cell is cooled to room temperature resulting in aligned smectic layers (31 in Fig. 7(c) and column 12, lines 29-47).

These are limitations set forth in claims 11, 14-16, 18 of the applicant's invention.

Regarding the mercury or xenon lamp as the light source limitation of claim 17, the disclosure of Wolf and Tauber shows that mercury arc lamps have characteristic wavelengths in the ultraviolet range including the i-line wavelength of 365 nm (see Fig. 13-45).

However, although Sakaigawa et al. teach the formation of transparent ITO electrodes on both glass substrates, they do not expressly teach or suggest a pixel electrode formed on one of these substrates, which is a limitation of claim 1 of the applicant's invention.

Referring to Figs. 2(B), Yamazaki et al. disclose a liquid crystal cell that has a TFT active matrix (117) formed on one of the opposing glass substrates (116) that includes an ITO pixel electrode (113) (see column 7, lines 41-50).

Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teachings of Sakaigawa et al. and Yamazaki et al. in order to form TFTs as taught by Yamazaki et al. on one of the substrates of Sakaigawa et al. using the ITO electrodes as pixel electrodes. Yamazaki et al. recognize that TFTs can be used to control the cell images of liquid crystal displays and in such applications the transparent ITO pixel electrodes can be used to address these individual TFTs (see column 8, lines 1-8).

9. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sakaigawa et al. and Yamazaki et al. as applied to claim 11 above, and further in view of Lee et al.

As shown above the combined teachings of Sakaigawa et al. and Yamazaki et al. have all of the limitations set forth in claim 11 of the applicant's invention. However, neither Sakaigawa et al. nor Yamazaki et al. teach or suggest injecting the ferroelectric liquid crystal at a temperature that is above the smectic/nematic phase transition

temperature of the liquid crystal, which is the further limitation to claim 11 set forth in claim 12 of the applicant's invention. Lee et al. teach the injection of a liquid crystal and polymer mixture at a temperature around the isotropic phase transition temperature of the liquid crystal (see column 4, lines 13-48).

Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the teachings of Sakaigawa et al. and Yamazaki et al. by injecting the ferroelectric liquid crystal and liquid monomer mixture after the liquid crystal cell of Sakaigawa et al. has been heated to 90 degrees C. Lee et al. recognize that injecting the mixture at higher temperatures has the advantage of preventing separation of the mixture due to viscosity differences (see column 4, lines 14-18).

10. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sakaigawa et al. and Yamazaki et al. as applied to claim 11 above, and further in view of H. Furue et al.

As shown above the combined teachings of Sakaigawa et al. and Yamazaki et al. have all of the limitations set forth in claim 11 of the applicant's invention. However, neither Sakaigawa et al. nor Yamazaki et al. teach or suggest applying a direct current to the ITO electrodes when the ferroelectric liquid crystal is uniformly aligned, which is the further limitation to claim 11 set forth in claim 13 of the applicant's invention. H. Furue et al. teach the curing of a monomer mixed with a ferroelectric liquid crystal by

simultaneously applying ultraviolet light and a voltage of 4 volts (see Experiment section).

Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the teachings of Sakaigawa et al. and Yamazaki et al. by curing the monomer of Sakaigawa et al. through the simultaneous application of ultraviolet light and voltage during the curing step. H. Furue et al. recognize that their curing method has the advantage of improved electrooptical properties for ferroelectric liquid crystal displays (see Introduction section).

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Sako et al., Coles et al., Kumar et al., Miyazaki et al., and Kobayashi teach liquid crystal displays that have ferroelectric liquid crystals mixed with polymers.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen W. Smoot whose telephone number is 703-305-0168. The examiner can normally be reached on M-F (8:00am to 4:30pm).

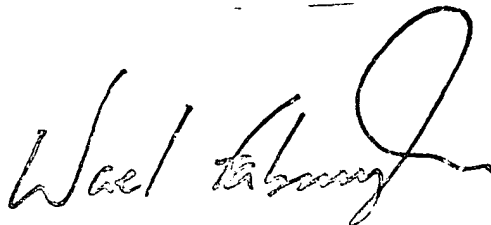
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on 703-308-4940. The fax phone numbers for the organization where this application or proceeding is assigned are 703-

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872-9318 for regular communications and 703-872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

SWS
April 5, 2003



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